FIG. 1

Glyceraldehyde 3-phosphate

══ + ═

Aspartic acid

→ → → Quinolinic acid

QPRTase

→ Nicotinic acid

→ Nicotine

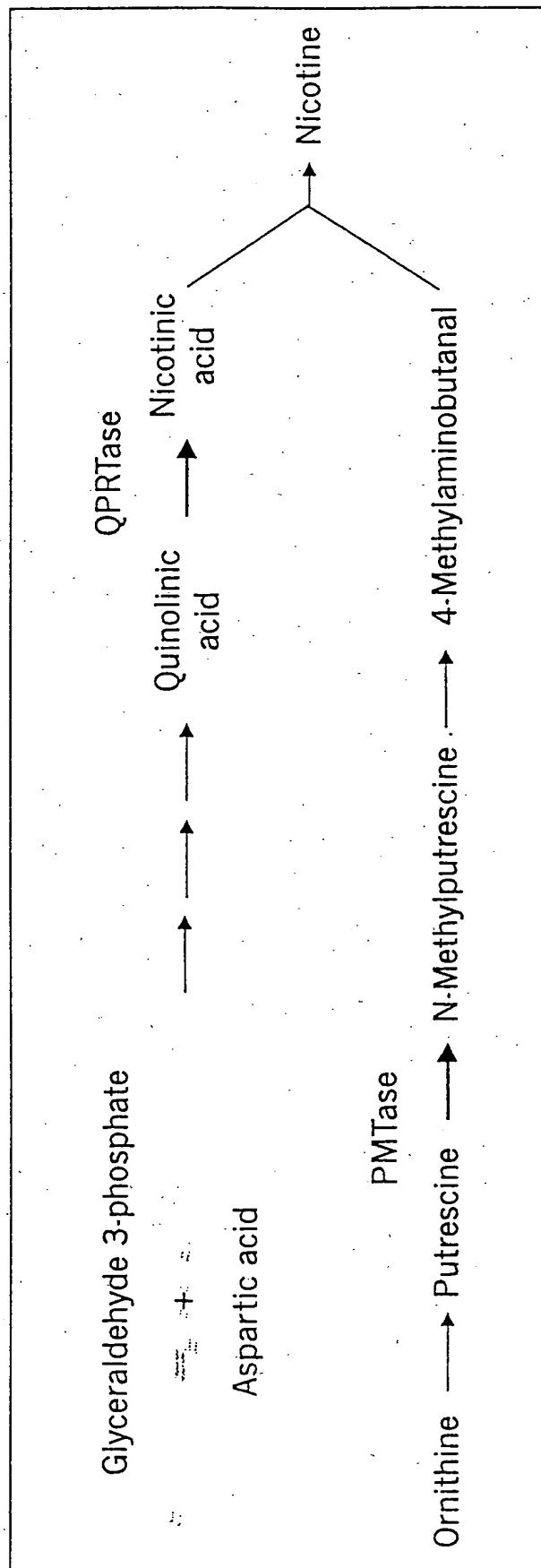Ornithine ⟶ Putrescine ⟶ N-Methylputrescine ⟶ 4-Methylaminobutanal

PMTase

caaaaactat tttccacaaa attcatttca caaccccccc aaaaaaaaac cATGTTTAGA   60
GCTATTCCTT TCACTGCTAC AGTGCATCCT TATGCAATTA CAGCTCCAAG GTTGGTGGTG   120
AAAATGTCAG CAATAGCCAC CAAGAATACA AGAGTGGAGT CATTAGAGGT GAAACCACCA   180
GCACACCCAA CTTATGATTT AAAGGAAGTT ATGAAACTTG CACTCTCTGA AGATGCTGGG   240
TTTCTAGCAA AGGAAGACGG GATCATAGCA GGAATTGCAC TTGCTGAGAT GATATTCGCG   360
GAAGTTGATC CTTCATTAAA GGTGGAGTGG TATGTAAATG ATGGCGATAA AGTTCATAAA   420
GGCTTGAAAT TTGGCAAAGT ACAAGGAAAC GCTTACAACA TTGTTATAGC TGAGAGGGTT   480
GTTCTCAATT TTATGCAAAG AATGAGTGGA ATAGCTACAC TAACTAAGGA AATGGCAGAT   540
GCTGCACACC CTGCTTACAT CTTGGAGACT AGGAAAACTG CTCCTGGATT ACGTTTGGTG   600
GATAAATGGG CGGTATTGAT CGGTGGGGGG AAGAATCACA GAATGGGCTT ATTTGATATG   660
GTAATGATAA AAGACAATCA CATATCTGCT GCTGGAGGTG TCGGCAAAGC TCTAAAATCT   720
GTGGATCAGT ATTTGGAGCA AAATAAACTT CAAATAGGGG TTGAGGTTGA AACCAGGACA   780
ATTGAAGAAG TACGTGAGGT TCTAGACTAT GCATCTCAAA CAAAGACTTC GTTGACTAGG   840
ATAATGCTGG ACAATATGGT TGTTCCATTA TCTAACGGAG ATATTGATGT ATCCATGCTT   900
AAGGAGGCTG TAGAATTGAT CAATGGGAGG TTTGATACGG AGGCTTCAGG AAATGTTACC   960
CTTGAAACAG TACACAAGAT TGGACAAACT GGTGTTACCT ACATTTCTAG TGGTGCCCTG 1020
ACGCATTCCG TGAAAGCACT TGACATTTCC CTGAAGATCG ATACAGAGCT CGCCCTTGAA 1080
GTTGGAAGGC GTACAAAACG AGCATGAgcg ccattacttc tgctataggg ttggagtaaa 1140
agcagctgaa tagctgaaag gtgcaaataa gaatcatttt actagttgtc aaacaaaaga 1200
tccttcactg tgtaatcaaa caaaaagatg taaattgctg gaatatctca gatggctctt 1260
ttccaacctt attgcttgag ttggtaattt cattatagct ttgtttttcat gtttcatgga 1320
atttgttaca atgaaaatac ttgatttata agtttggtgt atgtaaaatt ctgtgttact 1380
tcaaatattt tgagatgtt   1399

FIGURE 2A

MFRAIPFTAT VHPYAITAPR LVVKMSAIAT KNTRVESLEV KPPAHPTYDL   50
KEVMKLALSE DAGNLGDVTC KATIPLDMES DAHFLAKEDG IIAGIALAEM   100
IFAEVDPSLK VEWYVNDGDK VHKGLKFGKV QGNAYNIVIA ERVVLNFMQR   150
MSGIATLTKE MADAAHPAYI LETRKTAPGL RLVDKWAVLI GGGKNHRMGL   200
FDMVMIKDNH ISAAGGVGKA LKSVDQYLEQ NKLQIGVEVE TRTIEEVREV   250
LDYASQTKTS LTRIMLDNMV VPLSNGDIDV SMLKEAVELI NGRFDTEASG   300
NVTLETVHKI GQTGVTYISS GALTHSVKAL DISLKIDTEL ALEVGRRTKR   350
A   351

FIGURE 2B

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N. tabacum        MFRAIPFTATVHPYAITAPRLVVKMSAIATKNTRVESLEVKPPAHPTYDL
R. rubrum         *---------RPNH----------------------PVAALS*F----AI
M. leprae         .*---------LSDC----------------------EFDAAR--------
S. typhimurium    *---------PPRR*NPDDR*-----------DALL*RINLDI*A----AV
E. coli           *---------PPRR*NPDTR*-----------DELL*RINLDI*G----AV
H. sapien         *---------------D*EG*ALLLPPVTLAALVDSWLREDC*G------
S. cerevisiae     *--------------PVYE-HLLPVNGAWRQDVTNWLSEDV*S------


N. tabacum        KEVMKLALSEDAGNLGDVTCKATIPLDMESDAHFLAKEDGIIAGIA----
R. rubrum         D*AVRR**A**L*RA**I*ST****AATRAH*RFV*RQP**L**LGCA--
M. leprae         -DTIRR**H**LRYGL*I*TQ**V*AGTVVTGSMVPR*P*VIAGVDVALL
S. typhimurium    AQALREDLGGEVDAGN*I*AQL-L*A*TQAH*TVITR*D*VF----CGKR
E. coli           AQALREDLGGTVDANN*I*A*L-L*ENSR*H*TVITR*N*VF----CGKR
H. sapien         ------------------LNYAALVSGAGP*QAALWAKSP*VL----AGQP
S. cerevisiae     ------------------FDFGGYVVGSDLKEANLYCKQD*ML----CGVP


N. tabacum        -LAEMIFAEVDPSLKVEWYVNDGDKVHKGLK------FGKVQGNAYNIVI
R. rubrum         --RSAF-ALLDDTVTFTTPLE**AEIAA*QT------VAE*A*A*RT*LA
M. leprae         VLD*VF-GVDGYRVLY--R*E**ARLQS*QP------LLTVQAA*RGLLT
S. typhimurium    WVE*VFIQLAGDDVRLT*H*D***AI*ANQT------VFELN*PARVLLT
E. coli           WVE*VFIQLAGDDVTII*H*D***VINANQS------LFELE*PSRVLLT
H. sapien         FFDAIFTQL---NCQVS*FLPE*S*LVPVAR------VAEVR*P*HDLLL
S. cerevisiae     FAW*VFNQC---ELQVE*LFKE*SFLEPSKNDSGKIVVAKIT*P*K**LL


N. tabacum        AERVVLNFMQRMSGIATLTKEMAD--AAH--PAYILETRKTAPGLRLVDK
R. rubrum         ***TA***LGHL*****R*RRFG*AI*HT--R*RLTC****T****GLE*
M. leprae         ***TM***VCHM*****V*VAWV*AVRGT--K*KIRD****L****ALQ*
S. typhimurium    G**TA***V*TL**VASEVRRYVGLL*GT--QTQL*D****L****TAL*
E. coli           G*PTA***V*TL**VASKVRHYVELLEGT--NTQL*D****L****SAL*
H. sapien         G***A**TLARC****SAAAAAVEAARGAGWTGHVAG****T**F***E*
S. cerevisiae     ***TA**ILSRS****TASHKIISLARSTGYKGTIAG****T****RLE*


N. tabacum        WAVLIGGGKNHRMGLFDMVMIKDNHISAAGGVGKALKSVDQYLEQNKLQI
R. rubrum         Y**RC***S***F**D*A*L******AVA***SA**SRAR-AGVGHMVRI
M. leprae         Y**RV***V***L**G*TAL*****VA*V*S*VD**RA*R-AAAPEL-PC
S. typhimurium    Y***C***A***L**T*AFL******I*S*S*RQ*VEKAF-W*HPD-APV
E. coli           Y***C***A***L**S*AFL******I*S*S*RQ*VEKAS-W*HPD-APV
H. sapien         YGL*V**AAS**YD*GGLVML*D**VVPP***EK*VRAARQ---AADFAL
S. cerevisiae     YSM*V**CDT**YD*SS**ML*D***W*T*SITN*V*NARA---VCGFAV
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FIGURE 3

```
N. tabacum      GVEVETRTIEEVREVLDYASQTKTSLTRIMLDNMVVPLSNGDIDVSMLKE
R. rubrum       EI****--L*QLA***AVGGAEV-----VL****-----DAPT----*TR
M. leprae       E****S--L*QLDAM*A-EEPEL-----*L***F--*VWQTQV----AVQ
S. typhimurium  E****N--LDELDDA*K-*GADI-----*****F-----NTDQ----MR*
E. coli         E****N--L**LD*A*K-*GADI-----*****F-----ETEQ----MR*
H. sapien       K****CSSLQ**VQAAE-*GADL-----VL***F------KPEELHPTAT
S. cerevisiae   KI***CLSED*AT*AIE-*GADV-----*****F------KGDGLK*CAQ


N. tabacum      AVELI---NGRFDTEASGNVTLETVHKIG-QTGVTYISSGALTHSVKALD
R. rubrum       **DMV---A**LV*****G*S*D*IAALA-ES**D***V*******TT**
M. leprae       RRDIR---APTVLL*S**GLS**NAAIYA-G***DYLAV*******RI**
S. typhimurium  **KRV---**QARL*V*****AE*LREFA-E***DF**VG******R***
E. coli         **KRT---**KALL*V*****DK*LREFA-E***DF**V*******Q***
H. sapien       *LKAQFPSVA---VEA**GIT*DNLPQF-CGPHIDV**M*M**QA*P***
S. cerevisiae   SLKNKWNGKKHFLLEC**GLN*DNLEEYLCD-DIDIY*TSSIHQGTPVI*
```

		% Identity	% Similarity
N. tabacum	ISKLIDTELALEVGRRTKRA		
R. rubrum	*G*D*VVA-----PPKAERA	15.9	43.2
M. leprae	*G*DL	18.3	37.3
S. typhimurium	LSMRFC	18.2	34.8
E. coli	LSMRFR	17.9	32.8
H. sapien	F***L---F*K*VAPVP*IH	16.8	31.7
S. cerevisiae	F***LAH	14.6	27.8

FIGURE 3 continued
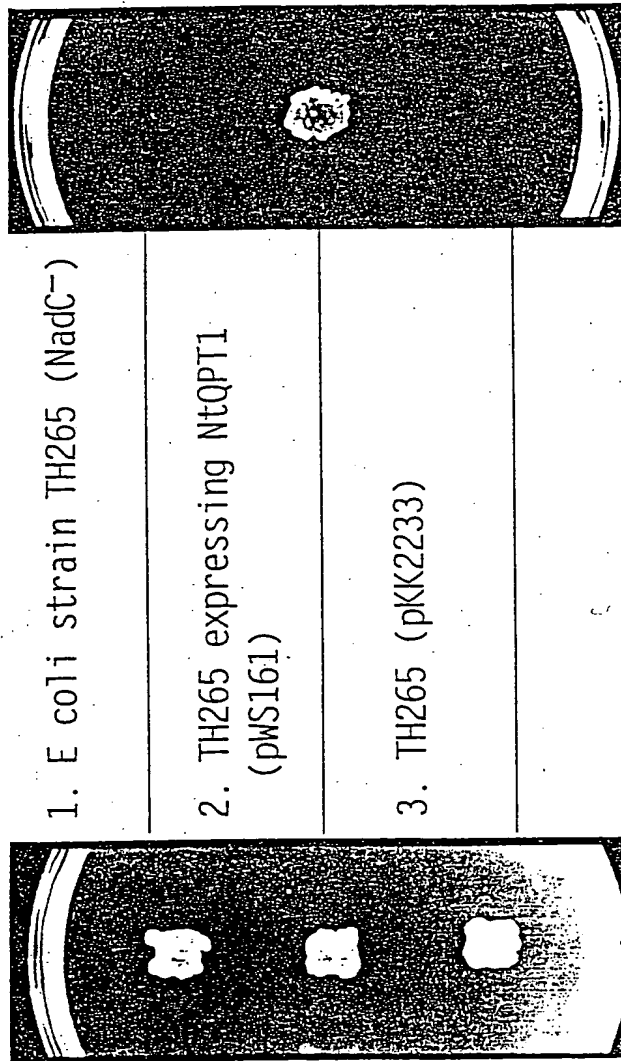
1. E coli strain TH265 (NadC−)

2. TH265 expressing NtQPT1 (pWS161)

3. TH265 (pKK2233)

ME Minimal Media
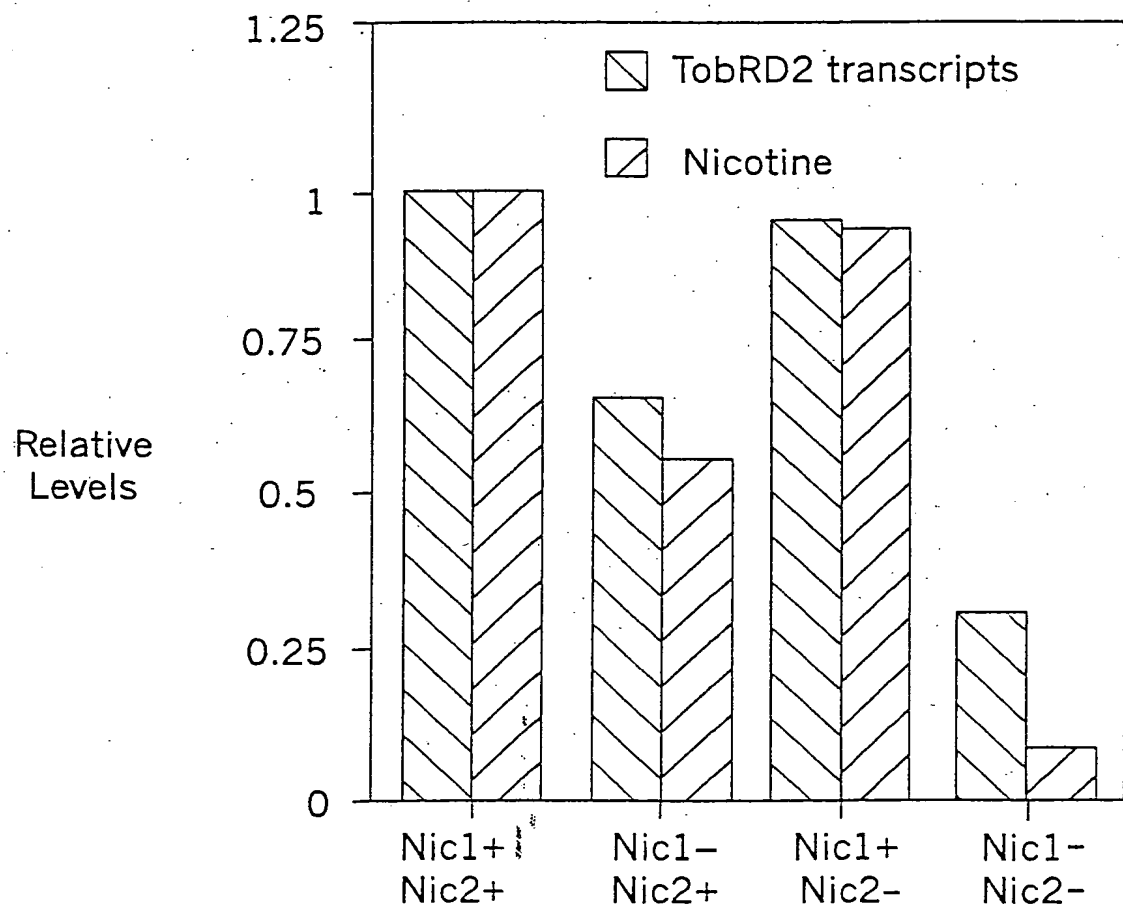
ME Minimal Media + Nicotinic Acid

FIG.4

FIG. 5

FIG. 6